

Scott A. Hutchinson

Principle Member Technical Staff
Computational Sciences Department
Dept. 09233, MS 0316
Sandia National Laboratories
Albuquerque, NM 87185-0316
(505) 845-7996
sahutch@sandia.gov
<http://www.cs.sandia.gov/~sahutch>

Degrees	New Mexico State University , Las Cruces Klipsch School of Electrical and Computer Engineering
	Ph.D., December 1993 Major Fields: Electromagnetics and Computational Electromagnetics Dissertation: <i>Parallel Finite Element Analysis and Optimization of Electrical Defibrillation</i> Advisor: Professor Kwong T. Ng
	M.S.E.E., December 1989 Major Fields: Electromagnetics and Communications
	B.S.E.E., May 1988 Electromagnetics option
Experience	Principle Member of the Technical Staff, Computational Sciences Department, Sandia National Laboratories , Albuquerque, New Mexico (1994-Present). <ul style="list-style-type: none">• Technical Lead on the Xyce™ Parallel Electronic Simulator Project, a state-of-the-art distributed-memory parallel circuit simulation code.• Development and implementation of an unstructured finite element code for modeling chemically reacting flows and plasmas on massively parallel computers (MPSalsa)• Development of Krylov-subspace parallel iterative solvers (Aztec) (1994-2000).• Development of new methods for the inverse ECG problem in diagnosing cardiac conduction abnormalities. Research Fellow , Parallel Computational Sciences Department, Sandia National Laboratories, Albuquerque, New Mexico Development of optimization code for electrical defibrillation including work on parallel finite element and optimization codes (1993-1994). Outstanding Student Summer Program , Parallel Computational Sciences Department, Sandia National Laboratories, Albuquerque, New Mexico Development of unstructured finite element code for message passing massively parallel computers (1992). College Instructor , Klipsch School of Electrical and Computer Engineering, New Mexico State University, Las Cruces (1990-1992)

Referred Journal Publications

- S. Hutchinson, E. Hensel, S. Castillo, K. Dalton. The finite element solution of elliptical systems on a data parallel computer, *Intl. J. for Numer. Meth. in Eng.*, September 1991.
- S. Hutchinson, K. Ng, J. Shadid. A finite element algorithm for elliptical equations over unstructured domains on a data parallel computer, *Intl. J. for Numer. Meth. in Eng.*, September 1994.

- S. Hutchinson, K. Ng, J. Shadid and A. Nadeem. Electrical defibrillation optimization: An automated, iterative parallel finite-element approach, *IEEE Trans. Bio-Med. Eng.*, April 1997.
- J. Shadid, S. Hutchinson, G. Hennigan, H. Moffat, K. Devine, A. Salinger. Efficient parallel computation of unstructured finite element reacting flow solutions, *Parallel Computing*, 23, 1307-1325, 1997.
- R. Tuminaro, J. Shadid and S. Hutchinson. Parallel Sparse Matrix Vector Multiply Software for Matrices with Data Locality, *Concurrency: Practice and Experience*, March, 1998.
- A. Salinger, J. Shadid, H. Moffat, S. Hutchinson, G. Hennigan, K. Devine. Analysis of gallium arsenide deposition in a horizontal chemical vapor deposition reactor using massively parallel computations, *J. Crystal Growth*, 203, 516-533, 1999.

Referred Conference Publications

- S. Hutchinson, S. Castillo, E. Hensel. A basic finite element code on the Connection Machine, in *Proc. of the Fourth Annual Conference on Hypercubes, Concurrent Computers and Applications*, Monterey, CA, March 1989.
- S. Hutchinson, S. Castillo, E. Hensel. Solving 2-d electrostatic problems on the Connection Machine using the finite element method, in *Proc. of the 5th Annual Review of Progress in Applied Computational Electromagnetics*, Monterey, CA, March 1989.
- S. Hutchinson, S. Castillo, E. Hensel, K. Dalton. The finite element solution of two-dimensional transverse-magnetic scattering problems on the Connection Machine, in *Proc. of the Fifth Distributed Memory Computing Conference*, Columbia, SC, April 1990.
- S. Hutchinson and K. Ng. The solution of 3-D biomedical electrostatic problems on a data parallel computer, in *Proc. of the 13th Annual International Conference of the IEEE EMBS*, Orlando, FL, 1991.
- S. Hutchinson, S. Gao, L. Ai, K. Ng, O. Deale, P. Cahill and B. Lerman. Three-dimensional modeling of electrical defibrillation on a massively parallel computer, in *Proc. of Computers in Cardiology*, October, 1992.
- S. Hutchinson, O. Deale, B. Lerman and K. Ng. Modeling of electrical defibrillation on a massively parallel computer, *IEEE URSI Symposium Digest*, Ann Arbor, MI, June 1993.
- S. Hutchinson and K. Ng. An optimization algorithm for electrode configurations in transcardiac defibrillation, in *Proc. of the 15th Annual International Conference of the IEEE EMBS*, San Diego, CA, 1993.
- J. Shadid, S. Hutchinson and H. Moffat. Parallel performance of a preconditioned CG solver for unstructured finite element applications, in *Proc. of the Colorado Conference on Iterative Methods*, Breckenridge, Colorado, 1994.
- S. Hutchinson J. Shadid, H. Moffat and K. Ng. A two-level parallel direct search implementation for arbitrarily sized objective functions, in *Proc. of the Colorado Conference on Iterative Methods*, Breckenridge, Colorado, 1994.
- J. Shadid, S. Hutchinson, H. Moffat and G. Hennigan. A 65+ Gflop/s unstructured finite element simulation of chemically reacting flows on the Intel Paragon, in *Proc. of Supercomputing '94*, Washington, D.C., 1994.
- J. Shadid, S. Hutchinson H. Moffat and G. Hennigan. MP unstructured finite element simulations of chemically reacting flows, in *Proc. of the 7th SIAM Conference on Parallel Processing for Scientific Computing*, San Francisco, CA 1995.
- K. Ng, S. Hutchinson and S. Gao. Numerical analysis of electrical defibrillation – the parallel approach, in *Proc. 1995 Intl. Soc. for Computerized Electrocardiology Conf.*, Amelia Island Plantation, FL, 1995.
- J. Shadid, S. Hutchinson, G. Hennigan, H. Moffat, K. Devine and A. Salinger. Performance of Implicit Finite Element Applications for Irregular Problems on MIMD Parallel Computers, in

Proc. of Second Workshop on Solving Irregular Problems on Distributed Memory Machines, Tenth Int'l. Parallel Proc. Symposium, Honolulu, HA, April, 1996.

J. Shadid, R. Tuminaro, S. Hutchinson. Parallel iterative solution of the Navier-Stokes equations with heat and mass transfer, in *Proceedings of the Eighth SIAM Conference on Parallel Processing for Scientific Computing*, Minneapolis, MN, March 1997.

K. Devine, G. Hennigan, S. Hutchinson, A. Salinger, J. Shadid, R. Tuminaro. High performance MP unstructured finite element simulation of chemically reacting flows, in *Proceedings of SC'97*, San Jose, CA, November 1997.

K. Devine, J. Shadid, A. Salinger, S. Hutchinson, G. Hennigan. Toward parallel, adaptive mesh refinement for chemically reacting flow simulations, in *Proceedings of Tenth International Conference on Finite Elements in Fluids*, Tuscon, AZ, January, 1998.

S. Hutchinson, J. Castro, J. Shadid, R. Campbell. CORONA - A fully implicit, fully-couple continuum plasma modeling code, in *Advanced Computational Methods in Engineering – ACOMEN '98*, Ghent, Belgium, September 1998.

S. Hutchinson, R. Hoekstra, E. Keiter. Efficient topology and partitioning methods for parallel simulation of electric circuit problems, in *Proceedings of the Tenth SIAM Conference on Parallel Processing for Scientific Computing*, Portsmouth, VA, March 2001.

S. Hutchinson, E. Keiter, R. Hoekstra, H. Watts, A. Waters, T. Russo, R. Schells, S. Wix, C. Bogdan. The XyceTM Parallel Electronic Simulator - An Overview, in *Parallel Computing - Proceedings of the International Conference (ParCo2001)*, Naples, Italy, September, 2001.

D. Martin, P. Wilsey, R. Hoekstra, E. Keiter, S. Hutchinson, T. Russo, L. Waters. Integrating multiple parallel simulation engines for mixed-technology parallel simulation, in *Proceedings of the 35th Annual Simulation Symposium*, April 2002.

D. Martin, P. Wilsey, R. Hoekstra, E. Keiter, S. Hutchinson, T. Russo, L. Waters. Redesigning the WARPED simulation kernel for analysis and application development, in *Proceedings of the 36th Annual Simulation Symposium*, April 2003.

Technical Reports

B. Nguyen and S. Hutchinson. The Implementation of the Upwind Leapfrog Scheme for 3D Electromagnetic Scattering on Massively Parallel Computers, *SAND Tech. Rep.*, Sandia National Laboratories, Albuquerque, NM, 1995.

S. Hutchinson, J. Shadid and R. Tuminaro. **Aztec** Version 1.0 User's Guide, *SAND Tech. Rep.*, SAND95-1559, Sandia National Laboratories, Albuquerque, NM, 1995.

J. Shadid, H. Moffat, S. Hutchinson, G. Hennigan, K. Devine, A. Salinger. **MPSalsa** A Finite Element Computer Program for Reacting Flow Problems. Part 1 - Theoretical Development, *SAND Tech. Rep.*, Sandia National Laboratories, Albuquerque, NM, 1996.

J. Shadid, H. Moffat, S. Hutchinson, G. Hennigan, K. Devine, A. Salinger. **MPSalsa** A Finite Element Computer Program for Reacting Flow Problems. Part 2 - User's Guide, *SAND Tech. Rep.*, SAND97-3092, Sandia National Laboratories, Albuquerque, NM, 1997.

A. Salinger, J. Shadid, S. Hutchinson, G. Hennigan, K. Devine, H. Moffat. Massively Parallel Computation of 3D Flow and Reactions in Chemical Vapor Deposition Reactors, *SAND Tech. Rep.*, Sandia National Laboratories, Albuquerque, NM, 1997.

A. Salinger, J. Shadid, S. Hutchinson, G. Hennigan, K. Devine, H. Moffat. Analysis of gallium arsenide deposition in a horizontal chemical vapor deposition reactor using massively parallel computations, *SAND Tech. Rep.* SAND98-0242, Sandia National Laboratories, Albuquerque, NM, 1998.

S. Hutchinson, L. Prevost, J. Shadid, C. Tong, R. Tuminaro. **Aztec** User's Guide: Version 2.1, *SAND Tech. Rep.*, SAND99-8801J, Sandia National Laboratories, Albuquerque, NM, 1999.

R. Tuminaro, M. Heroux, S. Hutchinson, J. Shadid. Official **Aztec** User's Guide: Version 2.0, *SAND Tech. Rep.*, SAND99-8801J, Sandia National Laboratories, Albuquerque, NM, 1999.

J. Shadid, A. Salinger, R. Schmidt, T. Smith, S. Hutchinson, G. Hennigan, K. Devine, H. Moffat. **MPSalsa** Version 1.5 - A Finite Element Computer Program for Reacting Flow Problems. Part 1 - Theoretical Development, *SAND Tech. Rep.*, Sandia National Laboratories, Albuquerque, NM, 1999.

H. Watts, E. Keiter, S. Hutchinson, R. Hoekstra. Time integration algorithms for the XyceTM Parallel Electronic Simulator, in *Proceedings of the IEEE International Symposium on Circuits and Systems (ISCAS 2002)*, Sydney, Australia, 2001.

S. Hutchinson, E. Keiter, R. Hoekstra, L. Waters, T. Russo, E. Rankin, S. Wix. XyceTM Parallel Electronic Simulator: User's Guide, Version 1.0, *SAND Tech. Rep.*, SAND2002-3790, Sandia National Laboratories, Albuquerque, NM, 2002.

E. Keiter, S. Hutchinson, R. Hoekstra, E. Rankin, T. Russo, L. Waters. Computational algorithms for device-circuit coupling, *SAND Tech. Rep.*, SAND2003-0080, Sandia National Laboratories, Albuquerque, NM, 2003.

Invited seminars

S. Hutchinson, J. Shadid and K. Ng. Two-level parallel optimization of electrode configuration parameters as applied to transmyocardial defibrillation, *First World Congress on Computational Med.*, Austin, TX, 1994.

S. Hutchinson. Building on libraries - Successes and challenges of a modern scientific application code, in *Proceedings from the Conference on High Speed Computing (a.k.a. Salishan)*, Gleneden Beach, Oregon, April, 2002.

DOE ASCI Solvers Workshop, August, 2002, Monterey, CA.

S. Hutchinson. The Numerical Aspects of XyceTM: Equations, Solvers and Needs. The Digital Technology Center at the University of Minnesota, February, 2003.

Honors

Finalist, 1994 **Gordon Bell Prize** in high performance computing for entry entitled: *A 65+ Gflop/s unstructured finite element simulation of chemically reacting flows on the Intel Paragon*.

R&D 100 Award for Aztec – A Parallel Sparse-Matrix Solver Library, 1997.

Finalist, 1997 **Gordon Bell Prize** in high performance computing for entry entitled: *High Performance MP Unstructured Finite Element Simulation of Chemically Reacting Flows*.

Sandia National Laboratories Employee Recognition Award for Meritorious Achievement Award, 1999.

Sandia National Laboratories Employee Recognition Award for Meritorious Achievement, 2002.

Memberships

Member of IEEE Circuit and Systems Society.

Member of the Society for Industrial and Applied Mathematics (SIAM).

Member of Tau Beta Pi engineering honorary society.

Computer Skills

Extensive experience in C, C++, Fortran and Pascal languages.

Extensive experience with parallel programming for distributed memory (message passing) and shared memory parallel computers.

Familiar with I-DEAS and PATRAN finite element modeling software.

References

- Dr. Kwong T. Ng (dissertation advisor), Professor
Klipsch Department of Electrical and Computer Engineering
New Mexico State University
Box 30001, Dept. 3-O
Las Cruces, NM 88003-0001
(505) 646-6431
ngnsr@nmsu.edu
- Dr. John N. Shadid, Distinguished Member Technical Staff
Department 09221, MS 1111
Sandia National Laboratories
Albuquerque, NM 87185-1111
(505) 845-7876
jnshadi@cs.sandia.gov
- Dr. Bruce Hendrickson, Distinguished Member Technical Staff
Department 09226, MS 1111
Sandia National Laboratories
Albuquerque, NM 87185-1111
(505) 845-7599
bahendr@cs.sandia.gov